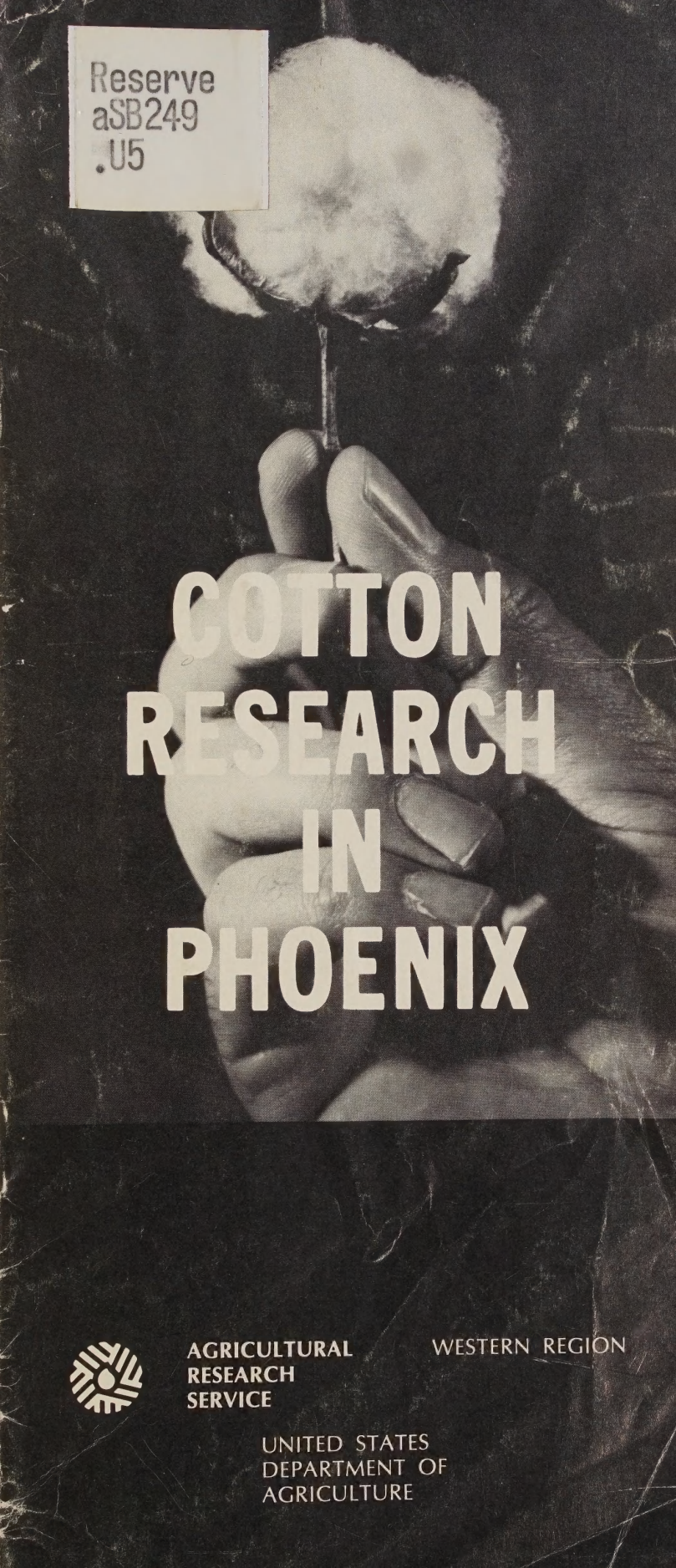


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# COTTON RESEARCH IN PHOENIX



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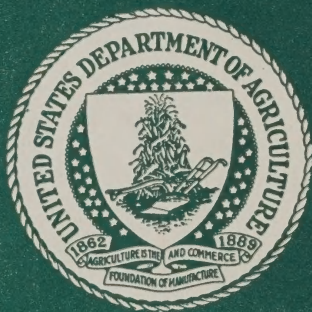
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# COTTON RESEARCH IN PHOENIX

## INTRODUCTION

This brochure is intended to acquaint you with cotton research conducted in Phoenix by specialists of the Agricultural Research Service (ARS).

ARS, the major research arm of the U.S. Department of Agriculture, is the largest agency of its kind in the world. Its primary mission is to help in meeting the food and fiber needs of our Nation. ARS works in close cooperation with State experiment stations, State departments of agriculture, other government agencies, public organizations, and with growers and industry.

The Agency's research is conducted at 155 laboratories, field stations, and work sites located in nine foreign countries and nationwide in four locally-administered geographical regions. Arizona and 11 Western States comprise the Western Region (WR). The WR is further divided into six administrative units—five Areas and the Western Regional Research Center, each under the leadership of an Area Director.

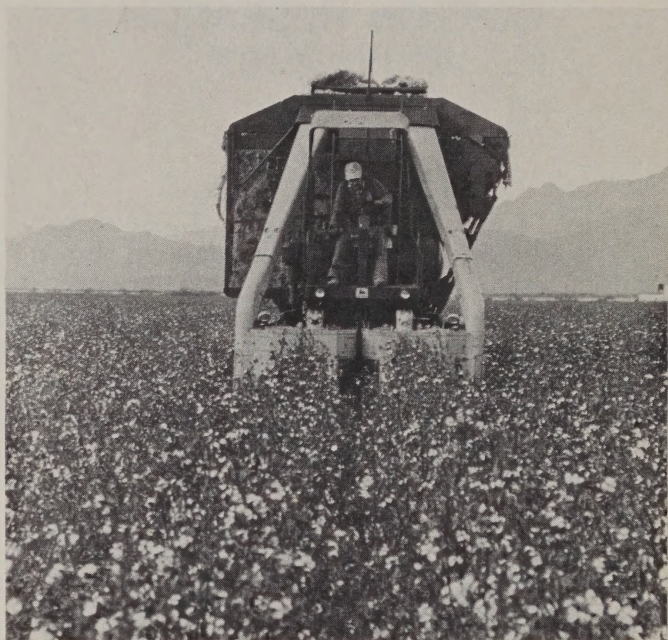
Arizona and New Mexico constitute an Area. Headquarters is at Tucson. Research programs are conducted at Tucson, Phoenix (Mesa), and Flagstaff, Arizona; and at Las Cruces and Albuquerque, New Mexico.

The organizational structure is designed to insure an aggressive research program by ARS and to provide for its maximum responsiveness to the problems and the needs of the people it serves.

## COTTON RESEARCH IN PHOENIX

Cotton research studies are conducted by ARS specialists at two facilities in Phoenix

(University of Arizona Cotton Research Center and ARS Western Cotton Research Laboratory). Results of this research have significant impact on Arizona and U.S. cotton production. The studies are instrumental in helping ARS in its ef-



forts to improve agricultural production efficiency. Studies here concentrate on:

- Developing improved cotton varieties and production practices;
- Determining factors which limit plant productivity and developing techniques to overcome these limits; and,
- Developing methods to control cotton insects.

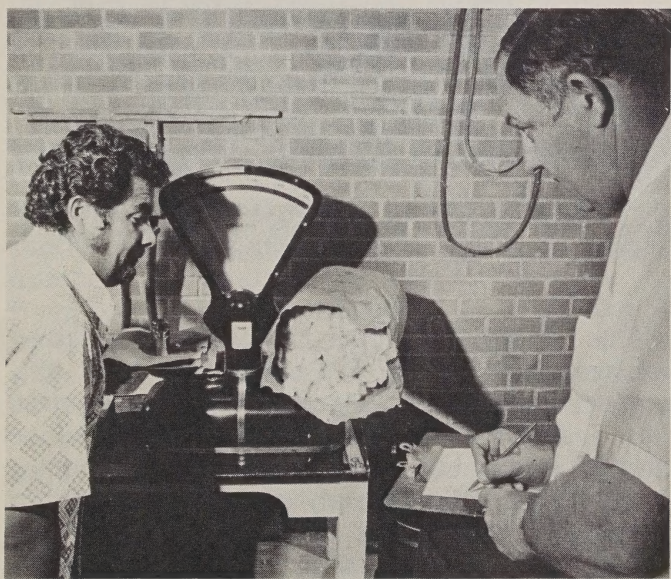
**COTTON BREEDING AND  
PRODUCTION RESEARCH UNIT**  
Cotton Research Center  
4207 E. Broadway Road  
Phoenix, Arizona 85040  
Telephone: (602) 261-4221

Scientists in this unit develop the improved varieties of Pima cotton that are released for commercial production in the Pima production





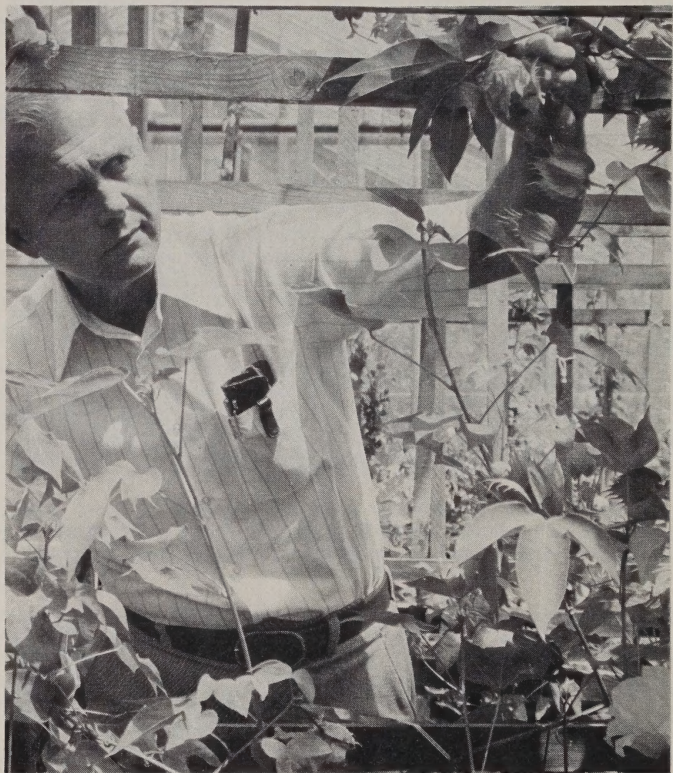
**Chemical spray is used to prevent late-season bolls from forming. This helps control pink bollworm population by depriving the insect of a food source needed for overwintering.**



**Tests show that the system causes minimal losses in fiber and seed yield and quality.**

area (Arizona, New Mexico, and west Texas). Production practices including irrigation, plant and row spacings, rotation schemes, dates of planting, fertilization, and chemical termination of fruiting are studied to provide information for improving cotton yield and fiber quality, and for controlling insects.

This work, begun by a USDA agency at Sacaton, Arizona, in 1907, has been conducted by ARS at Phoenix since 1956.



**Numerous crosses of various cotton strains often are made before fiber quality and yield are improved enough to warrant release for commercial production.**

Four improved cotton varieties have been released for commercial production from this program since 1960. Each successive release has resulted in higher yield, improved fiber quality, and better adaptation to environmental and growing conditions encountered in the Pima production area.

The results of this research have great impact on the agricultural economy of the States where Pima cotton is grown since the entire Pima cotton acreage (approximately 100,000 acres) is



planted with varieties developed in this program. The annual value of the fiber and seed from the crop amounts to more than \$30 million which, in turn, contributes at least \$140 million to the overall economy in the southwestern United States.

Genetic research here deals with developing plant materials that have certain desirable characteristics needed for continued varietal improvement. Current production practices developed in this research unit are used widely to manage these improved varieties for maximum yield and fiber quality. Also, treatments have been developed at the Station for the chemical termination of fruiting to aid in the control of cotton insects.

Looking ahead, the scientists hope to develop even more productive, earlier maturing varieties of Pima cottons with improved fiber quality in terms of processing efficiency and end-use suitability. Earlier maturing plants will be more compatible with the improved cultural systems designed for better control of insects.

## **COTTON PHYSIOLOGY RESEARCH UNIT**

**Western Cotton Research Laboratory  
4135 E. Broadway Road  
Phoenix, Arizona 85040  
Telephone: (602) 261-3524**

Researchers in this unit study the effects of environment on cotton growth and productivity; methods of improving the photosynthesis process; movement and utilization of photosynthetic products for the production of fiber and seed; the biochemistry of photosynthesis and other physiological processes which affect growth and production; nutrition in cotton with emphasis on nitrogen metabolism; and the influences on plant productivity of water and other stress conditions encountered in the West.

Cotton physiology research at Phoenix began in 1962. The Western Cotton Research Laboratory, where this work now is performed, was established in 1970.

Unit scientists have discovered a direct relationship between photosynthesis and the



**Specially-designed equipment is used in studies on the role of photosynthesis in cotton yields.**

ability of cotton plants to retain bolls. In their experiments, they determined that by increasing daily photosynthetic output by 25 percent, the harvestable yield of cotton could be increased by more than 50 percent.

Also, techniques were developed by unit researchers for monitoring leaf temperature and daily water stress in plants to enable them to be used as plant indicators for irrigation scheduling. Tests showed that productivity decreased as midday water stress in leaves increased.

The scientists expect their studies to be instrumental in the eventual development of extremely high-producing cotton plants, i.e., plants with large numbers of bolls per plant and with the capability to use water and nutrients more efficiently than now.

## **COTTON INSECTS - MANAGEMENT AND BIOLOGY RESEARCH UNIT**

**Western Cotton Research Laboratory**

**4135 E. Broadway Road**

**Phoenix, Arizona 85040**

**Telephone: (602) 261-3524**

Studies in this unit are concentrated on cotton insect pests in the Western States, especially the pink bollworm. Other insects also under

study include plant bugs and other bollworm species. The studies cover insect behavior and biology; mathematical models of populations development as affected by environment and other conditions; insect genetics as it affects population development; the use of sterility to suppress insect populations; breeding and selection of insect resistant cotton strains; and the evaluation of potential cotton insect control methods in integrated systems.



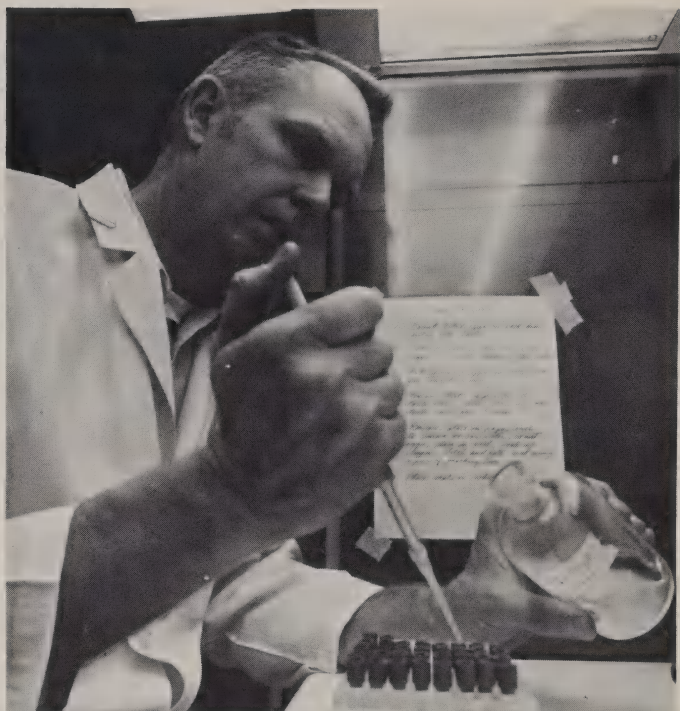
**The pink bollworm; the most destructive cotton insect pest in the Southwest.**

Cotton insect research in the Phoenix area was begun in the early 1930's near Buckeye, Arizona, moved to Mesa, Arizona in 1940, to the Cotton Research Center at Phoenix in 1959, and now is located in the Western Cotton Research Laboratory.

Though almost all cotton insect pests of the Southwest are under study, major emphasis is on the most destructive—the pink bollworm. This insect is to blame for losses amounting to approximately \$12 million annually in Arizona alone.

In concentrated studies on the pink bollworm, unit scientists: discovered hexalure, the first such synthetic attractant for the insect, and developed its use as a technique for detecting, surveying, and monitoring pink bollworm field populations; found that lower radiation doses were effective in sterilizing the insect resulting





**Researcher charges insect attractant lure containers.**

in a highly competitive insect which increases the effectiveness of control programs using the sterile insect method; determined that sex pheromone traps were effective aids in control work; and found a nondiapausing pink bollworm strain that, when introduced into wild populations, could reduce the winter survival rate.

Strains of cotton with some resistance to pink bollworm and plant bugs have been developed. Of these, the nectariless strains show particular promise in pink bollworm control. These plants lack nectaries (a source of nourishment for the insect) on the leaves and areas below the flowers.

Another technique that may prove useful in control programs is chemical termination of cotton fruiting in the early fall. In this system, chemical plant growth regulators are used to prevent formation of new bolls. This reduces the number of diapausing (overwintering) pink bollworm larvae that develop in the fall, thus diminishing the number of insects that emerge

the following spring to infest the new crop. Tests show that the number of larvae may be reduced in this manner without reducing yields.

All these results are promising, but researchers conclude that no single method will control the pink bollworm. Therefore, they are combining several methods (nectariless cotton, pheromone traps, chemical termination of fruiting, and judicious use of insecticides) into an integrated control approach. More testing is needed, but preliminary results look promising.



**Effects of attractant are verified in field traps.**



**Geneticist checks bolls for desirable traits in variety improvement research.**



**Nectar from glands on leaf of nectaried cotton strain provides food for insect enemies.**





**Researchers checking traps to determine numbers of overwintering pink bollworms.**

**COTTON INSECTS - PATHOLOGY  
AND REARING RESEARCH UNIT  
Western Cotton Research Laboratory  
4135 E. Broadway Road  
Phoenix, Arizona 85040  
Telephone: (602) 261-3524**

Pathology and rearing research is aimed at identifying and evaluating disease organisms of insects that have potential for controlling cotton insects, and at developing improved methods for rearing the large numbers of cotton insects needed for use in research and control programs.

Current emphasis in pathology is on the use of a virus disease, isolated from the alfalfa looper insect, as a biological control measure. Laboratory studies show that this virus has good potential for controlling the pink bollworm, tobacco budworm, cotton leafperforator, and the cabbage looper. Methods of the virus application and its use in the field are under study. For example, bait formulations of the virus have been found to be more effective than applications of the virus as a spray.

In rearing research, the scientists at Phoenix have determined that a polystyrene foambead substrate increases mass rearing capability. They have also found several new types of rearing containers that appear to have the

potential needed for developing more efficient rearing systems (needing less manpower, thus more economical) to meet today's needs as well as the expanded requirements anticipated in the future.

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Visitors to any of the ARS facilities in Phoenix are welcome. However, tour arrangements should be made by phone or mail as far in advance as possible by contacting the particular unit to be visited. Children must be accompanied by adults. Business hours are from 8:00 am to 4:30 pm, Monday through Friday, except holidays.

Any questions regarding agricultural research at Phoenix, in the Western Region, or anywhere throughout the Agency, may be directed by mail or phone to:

**Location Leader  
ARS-USDA  
Western Cotton Research Laboratory  
4135 E. Broadway Road  
Phoenix, Arizona 85040  
Telephone: (602) 261-3524**





